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# THE PHYSIOLOGICAL ARGUMENT AGAINST REALISM

THE chief argument against realism is that which has lately been called the physiological argument. It is based upon the generally recognized fact that our sensations come to us through the mediation of our sense organs. Without proper anatomical equipment and its proper physiological functioning there would be no sensations. Sensations are thus variables, dependent on the variations of physiological processes. Hence, it is argued, the qualities present in sensation can not be qualities of independent objects, but must be merely mental in their nature. As Locke puts it, they are ideas produced in us; they "are in truth nothing in the objects themselves," or rather "there is nothing like our ideas existing in the bodies themselves. They are in the bodies, we denominate from them, only a power to produce those sensations in us."[1]

Now it is probable that the mere fact that we are aware of sense qualities only when certain physiological processes are going on would never have led any one to suppose that these qualities do not belong to independent objects. If we always got the same sensations from the same object no matter what our state of body or our moods might be, and if we had reason to suppose that these sensations are exactly similar to those that other persons experience, the fact that these sensations are mediated by physiological processes would perhaps never have aroused any suspicion as to the subjectivity of the qualities sensed. But such is not the case. Only a little examination of our experience is necessary to show that sometimes "the same body which appears cold to one hand seems warm to another," as Berkeley puts it. "Again, it is proved that sweetness is not really in the sapid thing, because the thing remaining unaltered the sweetness is changed into bitter, as in case of a fever or otherwise vitiated palate."[2]

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[1] "Essay concerning Human Understanding," Book II., Chapter VIII., §§ 14, 15. Of course Locke limits this statement to what he calls "secondary qualities."

[2] "Treatise concerning the Principles of Human Knowledge," § 14.

Now if we can sense such different qualities in one and the same object at the same time, or at different times when we have no reason to think that the object itself has changed in the meanwhile, it is obvious that we have to suppose that all these seemingly incompatible qualities are united in the object, or else to suppose that sometimes at least our senses falsify the qualities of objects which they purport to give. The former alternative is unpalatable to us because we are prone to think that reality must not be self-contradictory. If the object really has color, it must choose which color it is to have in any part of it at any time. It must not have all the colors of the rainbow all over it all the time. If this were possible, then there is no reason why every object should not have every quality, every size, every speed of motion, and so on. Our senses would be sieves, which would each let only one quality through at any time from any one part of the object into the experience of any single person. Such a theory would be tenable if one cared to say that the law of contradiction applies not to real objects, but only to so much of the real objects as we can experience at any one time. The law would thus be the law of the sieve and of what in consequence is sifted through, but not the law of what lies above the sieve. But such an interpretation of the law of contradiction is repugnant to common sense. We tend to apply the law to reality as a whole, as well as to those aspects of reality which we can at any time perceive.

Hence the only resort is to maintain that the senses are deceptive. But if they deceive us, how can we know that they do not always deceive us? *Falsus in uno, falsus in omnibus* is a maxim we apply to them, and we get thus the doctrine of the entirely subjective character of our sensations.

Having thus obtained the doctrine, we proceed to explain the falsification of the senses by the fact that our sensations are dependent upon physiological processes—a fact which, as I observed above, would probably never have awakened doubt touching the objective character of sense qualities if that fact had stood alone. This makes it advisable to examine the physiological argument by itself, and thus to see whether that argument by itself has any force against realism.

As we have seen, the physiological argument starts with the fact of the correlation of our experience with our physiological processes. But there is another fact in our experience that is equally indubitable, and that fact is that we perceive objects which, until we begin to get sophisticated, are regarded as real and independent of our perceiving. Unless we keep in touch with this naïve experience in which there are real and independent objects presented, we can have no psychophysical correlation—no correlation between objects perceived, on the one hand, and real brain events, on the other. If the objects perceived are reduced to merely subjective processes, then the brain events upon which, according to the law of psychophysical correlation, they depend, must in consistency be interpreted as merely subjective processes also. For, of course, we have no better evidence of the existence of brain events than we have of other "external" objects.[3] The fact is that we know the one in exactly the same way as we know the other.

But suppose that we grant this, and yet try to take away the realistic implications involved in the admission by saying that the object which we see and the nerve and brain which mediate the seeing are all subjective, all ideal. Does not this put idealism on a better footing? I think not. The processes of nerve and brain have the disadvantage of not existing as objects of consciousness every time that we have perceptions through their mediation. If we were always conscious, first of brain event, and then of a perception of some "external" object dependent on that event, we probably could, if we pleased, state the fact of psychophysical correlation as a fact of constant sequence among actually present subjective processes, without prejudice to the law of correlation. But perceptions have a way of appearing without the previous appearance of their corresponding brain events. Hence if we are to accept the law of correlation as valid, the brain events must be admitted to be real *without being present in consciousness.* Thus the law of correlation may not be interpreted in such a way as to derealize the unperceived physiological processes. Either that law is true and the brain events corresponding to perceptions are real though not perceived, or else the brain events are not real and then the law is not true. To start with the reality of brain events, and on this reality to build up a theory which denies this reality, is to play fast and loose with logic. We may, therefore, say that idealism can not without manifest contradiction build on the law of correlation a theory which involves the non-existence of actual brain events corresponding to perceptions; for the law of correlation is a true law only if there are actual brain events, unperceived, corresponding to perceptions of "external" things.

Professor Strong has attempted to meet this difficulty which confronts the idealistic theory by substituting "possible perceptions" of the brain events for the actual brain events which realism postulates. The result is that before (or perhaps along with, or even a little after) every perception of an "external" object there is placed a "possible perception" of a brain event. In place of a real correlation between two real things, there is thus put a correlation between a figment and a reality. This reminds me of an invitation I once received to join a party of little tots in a journey to the moon. I pointed out that I had no vehicle for the purpose. I was told that my chair would do. I then pleaded that I did not find myself moving in the desired direction. I was told that I could play that I was moving. Professor Strong *plays* that there is a possible perception of a brain event corresponding to actual perceptions of trees and stars.

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[3] See Professor Fullerton's admirably lucid chapter on "The Metaphysics of the 'Telephone Exchange'" in his "System of Metaphysics," p. 342 ff.

But Professor Strong would perhaps think that this is not quite fair. He would say that the perception of the brain event is *really* possible. I am afraid, however, that the word "possible" is rather confusing. Under other conditions than those now prevailing when I see a tree, it might be possible to get a perception of a brain event that was occurring in my own cranium, but the *actual* perception of the complex brain event corresponding to my present entire experience would alter this experience very considerably. Hence the "possible" perception on which the "real" present perception depends is *im*possible under just the conditions under which the real perception is possible. We might as well, therefore, say that every "external" perception is preceded by what, under the conditions under which it appears, is an impossible perception of a brain event making that "external" perception possible! This certainly explains the "external" perception and maintains the law of psychophysical correlation very beautifully.

Anything is possible when certain conditions for its actuality are given and the remaining conditions are ignored or are unknown. Thus when I have thrown dice and still hold the cup over the dice, I may say it is possible that I have thrown double-six. The assertion of such a possibility is justified only on the basis of certain actual facts which are known; that is, on the basis of a reality of which we know something and of which we do not know everything. *Possibility presupposes reality* and is a category which we use when we assert our knowledge of certain aspects of this reality and either ignore or are ignorant of the remaining aspects. Possibility is itself possible only because of our ignorance. Now to take possibility of perception as the *meaning of reality*, rather than to make the possibility of perception depend on a reality which might be perceived if the conditions were favorable, and to do this merely that one may maintain an idealistic theory, is as violent and preposterous a procedure as the bloodless annals of philosophy have ever recorded, and its violent character is not abated by the fact that there is historical precedent for it.

But does not the fact that the object of vision arises on condition of certain processes in the brain make the object of vision in some sense less real than the brain which conditions it? How can the object be prior to the process in the brain so as to initiate the process and also subsequent to the process as its result? Can the seen tree be the same tree as that which causes the physiological process on which the seeing of the tree depends? Is not this to make the thing the cause of its own cause? It is—*if* we assume at the outset that the thing perceived is merely a "state of consciousness," which of course can not arise till there is a consciousness of which it is the state. But if we distinguish between *sensum* and *sentire* and *sensibile*,[4] then the difficulty vanishes. The *sentire* may be the effect of the physiological process, and yet the *sensum* may be the same as the *sensibile* which initiated the physiological process on which the *sentire* depends. Consciousness arises as the correlate of physiological functioning, and when it arises it does not produce its object. What object shall be present to it depends on the total situation within which the awareness occurs. If the situation contains, as a part of its factors, a tree acting through light waves on the retina, the optic nerve, and the brain, then why may not the tree rather than something else be the object of the awareness that arises in correlation with the brain activities induced? We have no right to determine *a priori* what under any given conditions shall be the object of awareness that arises under those conditions, any more than we have a right to determine *a priori* what shall be the effect of reducing the temperature of water to zero centigrade. We have to accept facts as we find them, and this humiliating prescription holds good as well in epistemology as in physics.

But it is argued that we are not obliged to accept contradictions, and that there is a contradiction in terms when it is stated that we can directly see the tree which causes the disturbances in the brain, on which our vision depends. There are too many things *lying between* the tree and the vision to make it possible for the vision to be *immediate*. We must, therefore, examine this contention. But first let me try to state the facts in the case under consideration in such a way that no contradiction seems to result, and then we shall be in a position to see the fallacy of those who try to make out a contradiction where no contradiction is.

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[4] See my recent article, "Prolegomena to a Tentative Realism," in this JOURNAL, Vol. IV., p. 449. My attention has recently been called to the fact that Professor Montague's article on "Current Misconceptions of Realism," which appeared in this JOURNAL, Vol. IV., p. 100, had anticipated mine on several points. I should have noted this fact in my previous article, for I had read Professor Montague's paper; but I did not have it in mind when I was writing.

The law of psychophysical correlation can best be stated in mathematical terms, using the word "function" in a mathematical sense. A "function" in mathematics, as every one knows, is a quantity that varies as some other quantity varies. Let us now take a number of functional equations related in a peculiar way:

$A = f(B)$, $B = f(C)$, $C = f(D)$, $D = f(E)$, $E = f(F)$; therefore $A = f(F)$.

This is a series of equations which tells us the way in which $A$ varies, ending with the statement that it varies with $F$. But it does not tell us *what* $A$ is. $A$ may be anything and $F$ may be anything so far as the formula goes. Anything else than the fact that $A$ varies with $B$, $C$, $D$, $E$, and $F$ must be learned from some other source than the formula. But when we apply the formula to facts of experience which the formula fits, the final equation, $A = f(F)$, holds good.

Now when this functional formula is applied to the case before us, $F$ is the *sensibile,* say a tree, separated from the *sentire* by a greater or less interval of time. The *sentire,* or awareness, does not find its expression in the formula, but the *sensum* does; the *sensum* is the $A$ of the formula, and for the realist this *sensum* is the same as the *sensibile;* it is the *sensibile in a different relation* from that in which it stands when it is regarded as the initiator of the brain processes. It is the *sensibile* as object of the *sentire.* The *sensibile,* as initiator of the brain processes, is the independent variable or the "constant" of the equation, and its variations condition the variations of $E$ (light waves), $D$ (retinal stimulation), $C$ (excitation of the optic nerve), $B$ (cortical disturbance, or "brain event"), and $A$ (*sensum,* the tree as object of awareness). The tree, as reality in the order of nature, acts on other objects in that order, viz., light waves, retina, optic nerve and brain, and then it appears in a new relation, as an object of awareness. In other words, a thing, in the variations it produces on light waves and bodily organism, is the condition of the variations which this same thing undergoes in another relation, namely, as object of an awareness which is correlated with a certain process in that organism. There is surely no contradiction in such an application of the functional formula.

One word is necessary on the above-indicated unvaryingness of the awareness. Awareness is the name of an abstracted feature of a concrete fact, namely, the fact of experience, or awareness-of-objects. *This concrete fact* varies, but when we examine the nature of its variations, we find that what changes is the complex of objects, not the awareness. We have here something parallel to the change that is undergone in an object whose size alters while its color remains the same. The concrete object changes, but not its abstract characteristic of color. So experience, the concrete fact under consideration, changes, but when we look closely into its changes, we find that the *objects* of experience change, but the awareness remains the same in all the changes of experience. At one time there is awareness of one set of objects, at another time there is awareness of another set. Now there are many objects, now there are fewer objects: the "field of awareness," *i. e.,* the range of objects, expands and contracts, just as an object expands and contracts when its size varies. But just as this enlargement and contraction do not make the color of the object change, so the expansion and diminution of the field of experience do not make the awareness change.

Is consciousness, therefore, a function of the bodily organism? Yes and no. Yes, in that, so far as we can judge from our experience, there is consciousness only when certain brain states occur. The *fact* of consciousness is a "function" of the bodily organism in the sense that this fact does not exist unless certain changes take place in the brain, and it exists when these changes do occur. But when changes of a certain kind thus occur, changes of the brain *within the limits of this kind* do not occasion changes in consciousness. The only changes that consciousness undergoes, if we may speak of them as changes *of* consciousness, are changes from existence into non-existence, and *vice versa.* The question with which this paragraph began must, however, be answered negatively, if "function" be taken in the stricter sense; for, as we have seen, many changes are possible in the brain which do not in any way result in a change of consciousness, in the only sense in which there is any change of consciousness. That is to say, many changes in the brain processes leave consciousness unchanged, while the *objects* of consciousness change. It is for this reason that in the functional formula given above the $A$ is not to be interpreted as consciousness, but as object of consciousness.

Now our functional formula, applied to the relation of the real thing to the perceived thing, still leaves a difficulty on our hands. How can what no longer exists *in re* still exist *in sensu,* if it be the same thing in either case? This question is forced on us by the fact that our perception is always at least slightly belated. As Professor Strong puts it, "The time needed for light rays to pass from the object to the eye and call forth the organic process to which perception corresponds has this result, that we perceive a slightly earlier state of the object than that which coexists with the perception."[5] In the case of the vision of a star, "The starlight I see left the star years and years ago."[5] The star that I see, therefore, must exist in the same state at two different times many years apart, if the star I see is the same as the real star in the order of nature.

Now the question how that which exists *in re* can also exist subsequently *in sensu* can be answered differently according to the different possible meanings to the question. If the question asks for the *process* by which the past thing becomes present object, the answer is given when our formula is interpreted in terms of our present problem. The past reality can be seen now and not before, because the intermediate functions are temporal functions and may require a long time to run their course.

But the question may mean, How can you escape the contradiction of saying that the same object existed long ago *in re* and now exists *in sensu?* How can numerically the same state of the object exist at two different times? I answer that contradiction exists only when "diversities are attached to one unyielding point assumed, tacitly or expressly, to be incapable of internal diversity or external complement."[6] The star as an object in the order of nature is identically the same star as that which is the object of consciousness, but the same star *in different relations,* and what is true of it in one relation may not be true of it in another relation, even though in both relations its position in time be involved. If the star were a vacuous identity, "incapable of internal diversity or external complement," of course this would be impossible. But as it is a thing that can stand in different relations, there is no contradiction. It is sufficient for the philosopher to state the facts in such a way that no contradiction results. He is not called on to explain everything he finds, except in so far as explanation consists in a statement of general principles. The principles themselves do not have to be explained. The general principle, in our case, is that the special time relations of things to each other differ according as these things are taken in their natural order or in their order as objects of immediate consciousness. So long as the two orders are distinguished, no contradiction is involved in considering the special time relations as different in the two orders.

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[5] This JOURNAL, Vol. I., p. 521. It was Professor Montague who brought Professor Strong to consider the disparity between the time of perception and the time of object perceived. But Professor Montague uses this time-disparity as an argument against what he calls a "telepathic theory of perception." I conceive it to be a proof of the theory, although I do not like the name with which he dubs it.

[6] Bradley, "Appearance and Reality," pp. 566, 567.

Every theory which admits the reality of time, whether as merely subjective in the Kantian sense, or as objective in the popular sense, must admit that the real time of an occurrence may differ from its apparent time. It is a principle without which we can not harmonize our experiences. The realism which I am studying does not make the difficulty; it solves the difficulty by pointing to a difference of relation which makes the thought of such a difference in time logically consistent, without making necessary the duplication of the object which thus has different relations. So far as I can see, therefore, we may consistently maintain that it is the same star which I now see and which existed perhaps a hundred years ago. It existed *in rerum natura* when I was not aware of it, and my awareness of it arises after a long interval. When this awareness does arise, it does not manufacture a counterfeit presentment of the obsolete star; neither does it call back to renewed life in the order of nature the extinct orb. The star, gone in the order of nature never to return *in that order,* returns *in another order,* the order of immediate objects of consciousness. In that order it takes the same date as that occupied by objects which in the natural order are long subsequent to the star as a dated fact in the natural order. Let me illustrate this difference of orders by referring to the fact that Wilhelm II as head of the German Empire far outranks Professor Harnack, who is merely a professor in a state university, and is thus separated from Wilhelm by many intervening principalities and powers. But in the order of historical scientific critics of the Apostles' Creed, Professor Harnack is perhaps *facile princeps,* and Wilhelm is faintly discernible in the lower ranks, among the unnamed subjects of his imperial realm. The first is last and the last is first. So, likewise, the same object can be differently disposed in time in the two orders of nature and of immediate presence to consciousness; for there is a natural order and there is a spiritual order.

But the question, How can a *past* reality be now *present* as an object of consciousness? may appear to have still another meaning. It may mean, How can consciousness be immediately aware of temporal things which do not belong to its own time?

Here emphasis may be laid on "immediately," and the question may mean, How can we be immediately aware of what is not immediately present? The answer is that "immediately" is here used in two senses. The first "immediately" brings out the fact that the object is actually an object of consciousness, standing *in propria persona* before consciousness, neither is there any daysman betwixt them, that might lay his hand on them both and bring them together by external arbitration. The second "immediately" is temporal: the object in the state in which it is now perceived belongs, as an object having a fixed place in the time order of nature, to the past, and there is an interval between the place it occupies in that order and the place that the consciousness of it occupies. The star may be an immediately present object of consciousness, but an object which we may be aware of as having existed "out of consciousness" long before it became an object of consciousness—nay, we may even have reasons for supposing that it no longer exists "out of consciousness."

There may be another ambiguity in the term "immediately present," which is responsible for the difficulty in accepting the immediate presence in consciousness of an object, like a star, which we have reasons for believing existed long before our consciousness became aware of it. To be "immediately present" to consciousness may mean to be present without having been brought to consciousness by any intermediating processes, or it may mean to be present in the unique way in which my hand is present in consciousness when I open my eyes and look at it. When I shut my eyes, my hand as a visible object is present in consciousness through a representative image; it is not immediately present, but representatively so. When I open my eyes and look at the hand, it is immediately present. But in either case there are physiological processes that mediate the presence of the object; in the one case as an immediate object, in the other case as a represented object. Thus an object can be both immediately present in consciousness and mediatedly so, just as a person may be immediately present in a police station and yet have been brought there by certain mediating agencies. This fact, however, is often overlooked in arguments against realism. It is assumed that the mere fact that no object ever presents itself to consciousness without the intermediation of physiological processes renders impossible the immediate presence of any object to consciousness.

But the question, How can a past reality be now present as an object in consciousness? may be asked with still another meaning, and therefore with still another required answer. It may mean, *Why* should there be an awareness now of objects that in time existed before the awareness? I give it up. But I will return the riddle. Why should there be *redness, roughness, rats?* Given a world in which such things are, we can laboriously trace the processes by which they came to be, arising in sequence on other things that have been. But if nothing is given, and then I am asked to explain how or why these things are brought into existence, I prefer to pass the question on to some orthodox professor of systematic theology.

All I know about the matter is that there *is* such an awareness and that we must accept the fact that *we constantly have immediate awareness of what in the natural order of timed things is not dated in the immediate present.* Immediate presence in consciousness and existence in the order of nature at the same time that consciousness exists are two different facts that we have to distinguish, just as we distinguish any other different facts. It is an old saying that most of the difficulties in philosophy are due to ambiguities in the words we employ in our philosophical reasoning. This is a case in which that saying applies. When we make the proper distinctions we find that the alleged contradictions of realism which we have been considering vanish; there is left only the existence of ultimate facts to be accepted or not as the evidence for them decides. There is no logical absurdity in the realistic doctrine on this point.[7]

If this has been made clear, we are in a position to see that the physiological argument which is directed against the realist returns as a boomerang against the idealist. Professor Strong, one of the present protagonists of antirealistic philosophy, admits, as we have seen above, that if we accept the facts of physics and physiology, we must admit that "we perceive a slightly earlier state of the object than that which coexists with the perception." This admission, instead of involving the *reductio ad absurdum* of realism, turns out to be a means of reducing idealism, at least of Professor Strong's kind, to absurdity. For we must remember that Professor Strong says that he has never been able to distinguish "the perception of a tridimensional book from the book itself."[8] If he can not make this distinction, how in the world can he speak of perceiving a slightly earlier state of the *object* than that which coexists with the *perception?* Here the object that is perceived is surely distinguished from the perception and is made to antedate the perception. The fact is that the physiological argument *demands* that the object perceived should exist before the perception, and therefore that *it should be distinguished from the perception.*

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[7] If we had the time here, it would be desirable to take up the various points involved in the distinction between the time order of nature and the time order of objects as immediately present to consciousness. I wish here merely to say that the realism we are studying does not deny the *reality* of the latter time order or of such objects as have a place only in that time order—such objects as images of past realities in the natural order. Everything is real in its own way, whether it exists in the one time order or in the other. Again, realism does not assert that there are *two times, separate from each other.* But this is too much of a problem to be taken up in this article.

[8] This JOURNAL, Vol. I., p. 547.

Professor Strong may not reply that the object perceived, which exists before the perception of it, is merely a "possible perception" which some Psyche might have had if she had been favorably situated to get it; for he has assured us that "in the endeavor to adjust the facts of experience to one another," you must not "be led to the conclusion that objects are *beyond* that of which you are immediately conscious, without having lost contact in some way with the firm ground of experience from which you set out."[9] Surely a possible perception *is* beyond that of which we are immediately conscious; hence the object can not be a possible perception. It is just the perception itself, and yet it precedes the perception itself! No wonder that Professor Strong admits "that there is an apparent antinomy here." The thing that one can not help wondering at is that he should say of the theory which gets him into such an antinomy: "The beauty of the panpsychist theory is that it enables us to clear it up quite completely."[9] There is more contradiction to the square inch here than Professor Strong has succeeded in showing to exist in the whole reach of realism. Although there is no distinction between perception and object, yet the object is past and the perception is present!

Now if the object which I see, and see immediately, is one that existed before my seeing of it, it follows, in the first place, that there is a distinction between the object and the perception. Hence we find that the physiological argument confirms the analysis I made in my articles "The Stream of Consciousness" and "Prolegomena to a Tentative Realism."[10] There I found that a distinction must be made between consciousness and that of which we are conscious. Here we arrive at the same result: without this distinction all objects must have the time of the experience to which they belong, or of the perceptions of them, and must be tied down to this time. In the second place, since the physiological argument is based on facts that necessitate the priority of objects to the awareness of them, it follows that realism is correct in maintaining that objects are *temporally independent* of the awareness of them. *The argument proves realism, instead of disproving it.*

There is one remark that should be made before this examination of the physiological argument is concluded. We have seen that the realistic view commits one to the acceptance of the principle that in one sense consciousness is functionally dependent on physiological processes. Such a principle, we are told, is "absolutely incomprehensible."[11] "Their conjunction would simply have to be accepted as an ultimate fact.''[11] The realist is perfectly willing to accept it as an ultimate fact if thereby he is enabled to accept the other ultimate facts that the idealist seems so desirous of accepting, namely, that what we perceive is the very object itself, that there are various events that functionally mediate the object and the brain event with which consciousness is correlated, and that these events interpose a time interval between the date of the object and the date of the awareness. The realist finds it easier to accept ultimate facts than contradictions and fallacies and jugglings with perceptions which make the same perception now actual and now possible, now present and now past—legerdemain of the ''now you have it and now you haven't it'' kind. He has to accept ultimate facts sooner or later anyway, and he can not see how an ultimate connection becomes any the less ultimate when it is smuggled into a bag labeled ''similarities,'' wherein he is assured that one can ''begin to 'see the effect in the cause.' '' That bag seems rather to hide the ultimateness than to remove it.

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[9] This JOURNAL, Vol. I., pp. 521–522.

[10] This JOURNAL, Vol. IV., p. 225 ff., and p. 449 ff.

[11] Strong, "Why the Mind has a Body," p. 153.

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## ATTENTION FATIGUE AND THE CONCEPT OF INFINITY

It is the purpose of this paper to suggest a relation between the smothering or diffusion of attention found as one element of intellectual fatigue, immediate or cumulative, and the metaphysical concept of infinity in the sense of the unlimited and unconditioned.

In any concept we may have, of course, either purely word-images or images visual, auditory, kinesthetic, etc., of the object or of the relation or series of objects and relations. Let us call them content-images to distinguish them from word-images and from the secondary representations, visual, auditory, kinesthetic, etc., of word-images. Much of our thinking is carried on in terms of word-images or of the secondary representations of them. As in pure mathematics or in purely formal logic—such as the work of Peano, Schröder or Bertrand Russell—we can manipulate symbols, regardless of the content represented by these symbols, so in much of our ordinary thinking we make large use of merely word-images. But for any except this formal type of reasoning we have to use content-images. Thus if we examine discussions of the metaphysical concept of infinity, as in Spinoza or Kant, we find the use of something more than mere word-images. We find content-images. For instance, in Kant's first antinomy the whole discussion is based on an